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AMBIENTE E DI MATEMATICA

An overview on multiscale and multidimensional non-matching coupling techniques

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Abstract: Many physical problems involving heterogeneous spatial scales, such as the flow-through fractured porous media, the study of fiber-reinforced materials, or the modeling of blood circulation in living tissues, just to mention a few examples, can be described as coupled partial differential equations defined in domains of heterogeneous dimensions that are embedded into each other.

The definition and the approximation of coupling operators that are suitable for this problem are still a challenge. I will present a general mathematical framework for the analysis and the approximation of partial differential equations coupled with non-matching constraints across different scales, focussing on their enforcement using Lagrange multipliers. I will discuss in general terms the well-posedness, stability, robustness of the problem with respect to the small scale, and their numerical approximation.



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